

Policy

A comparison of Australasian jurisdictional ambulance services' paramedic clinical practice guidelines series: Adult sepsis

Matt Wilkinson-Stokes BP, is a postgraduate student and paramedic¹; Elena Ryan is a paramedic¹; Michael Williams is a paramedic¹; Maddison Spencer is a paramedic and postgraduate student¹; Sonja Maria Sonja Maria PhD, GCClinED, GCLTHE, BClinPrac(Para) is a Senior Lecturer in paramedicine²; Marc Colbeck BHlthSc, MA, is a critical care paramedic, Senior Lecturer and Clinical Coordinator in Paramedicine¹

Affiliations:

¹Australian Catholic University, School of Nursing, Midwifery and Paramedicine, Queensland

²Charles Sturt University, Bathurst, New South Wales

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Abstract

Introduction

This article forms part of a series that seeks to identify interjurisdictional differences in the scope of paramedic practice and, consequently, differences in patient treatment based upon which jurisdiction a patient is geographically located within at the time of their complaint.

Methods

The current Clinical Practice Guidelines (CPGs) of each jurisdictional ambulance service (JAS) were accessed during June 2020, and updated in August 2021. Content was extracted and verified by 18 paramedics or managers representing all 10 JASs.

Results

Nine services provide antibiotics for meningococcal septicaemia, with dosage ranging from 1 – 4 grams. Five services provide antibiotics for non-meningococcal sepsis (three under doctor approval), with choice of antibiotic including Ceftriaxone, Benzylpenicillin, Amoxicillin, and Gentamicin. Three services provide antipyretics, one provides corticosteroids under doctor approval, and all provide fluids (with dosage ranging from 20 – 60 ml/kg). ICPs are allowed to provide adrenaline infusions in nine services, noradrenaline in three services (one requiring doctor approval), and metaraminol in three services. Two additional services restrict metaraminol to specialist paramedics, with one of these requiring doctor approval. Two services perform phlebotomy and one takes lactate. Paramedics perform unassisted intubation in one service, with nine restricting this to ICPs. Facilitated or Ketamine-only intubation is performed by ICPs in one service. Rapid or delayed sequence induction is performed by ICPs in six services, and restricted to specialists in two services.

Conclusion

The domestic jurisdictional ambulance services in Australasia have each created unique treatment clinical practice guidelines that are heterogeneous in their treatments and scopes of practice. A review of the evidence underlying each intervention is appropriate to determining best practice.

Keywords:

Australasia; emergency medical technician; guideline; paramedic; scope of practice; sepsis

Corresponding Author: Matt Wilkinson-Stokes, matt.wilkinson-stokes@outlook.com

Introduction

Australia and New Zealand (Australasia) are serviced by ten domestic jurisdictional ambulance services (JASs), each of which is sponsored by the corresponding state or territory government of their jurisdiction (in Australia) or their district health boards (in New Zealand). This paper is part of a series providing a comparison of current Australasian paramedic Clinical Practice Guidelines (CPGs) for the treatment of common conditions. A comparison of the different JASs' paramedic CPGs is likely to be of benefit in identifying variations in practice, and consequently highlighting areas for consideration or review by each JAS. Additionally, as a summary of the current scope of practice of the profession in general, a review is likely to be of interest to paramedics not employed by a JAS, other external bodies such as healthcare services, and educational institutions.

Methods

The methods are as outlined in the introductory article in this series (1). CPGs were accessed during June 2020, and content extracted by three registered paramedics. A copy of this paper was provided to each service for verification and optional feedback on 30 July 2020. Seven services formally verified the content – in six cases by a manager, and in one case by a paramedic. In addition, four paramedics employed by three of these services also informally verified content. Three services did not have capacity to formally review the paper. For each of these three services, a paramedic employed by the service informally verified content. Cumulatively, 18 paramedics or managers, including employees of all 10 JASs, provided verification of content. The content was updated in August 2021, prior to publication.

This series is endorsed by the Australasian College of Paramedicine's Clinical Practice Guideline Special Interest Group (ACP CPG SIG).

Results

The results are presented as outlined in the introductory paper in this series (1). The results of the comparison of CPGs as they specifically relate to adult sepsis are shown in Tables 1 to 10 of this article.

Limitations

This article is a descriptive analysis and comparison of a specific and discrete cluster of primary sources. This comparison does not review the peer-reviewed, published literature to determine current best practice in treatment, no conduct causal comparisons or grade analysis. Consequently, no CPG is inferred to be superior or inferior to any other, nor that the most common treatment is necessarily optimal. It is highly likely that differences between services will always be necessary due to regional variations in geography, demographics, and

organisational budgets. The purpose of this review is to make the community aware of differences in the current scope of practice of Australasian paramedics and to present variations between the CPGs of the JASs that may warrant further investigation.

We have attempted to present data accurately by accessing current CPGs and by verifying content with paramedics from each service. However, due to the fluidity of these organisations, changes to the CPGs between data extraction and publication remain possible.

Each CPG is presented in a way that is unique to each JAS, and an experienced paramedic in that service may accurately infer implications from that presentation that an unfamiliar viewer could remain unaware of. We have attempted to correct for this by verifying our interpretation of the CPG with paramedics from each service and providing a copy of the completed paper to each JAS for review prior to submission for publication; however, some mistaken interpretation remains possible. Similarly, common cultural practices in a JAS that are understood but not explicitly stated in the CPG could result in different interpretations between unfamiliar and experienced users of that CPG. Finally, paramedics may not necessarily adhere to their guidelines; actual treatment may vary from that published here.

Discussion

All JASs provide fluid and oxygen as basic cares; beyond this, treatment varies significantly between jurisdictions. Pharmacology varies in the choice of antibiotic, when antibiotics may be administered, use of an antipyretic, and use of vasopressors. Interventions vary in the taking of blood samples prior to administration of antibiotics, and in the use of endotracheal intubation (unassisted, facilitated or via ketamine only, or via rapid or delayed sequence induction).

Two JASs provide amoxicillin, clavulanic acid, and gentamicin to all septic patients with transport times over 30 minutes. Three JASs provide ceftriaxone under medical consult where prolonged transport times (defined variously as greater than 30 or 60 minutes) are anticipated. Nine JASs provide antibiotics for meningococcal septicaemia. One service does not carry antibiotics. Three JASs allow the provision of paracetamol as an antipyretic to febrile septic patients. One service provides dexamethasone under medical consult. All services administer oxygen, however, peripheral saturation targets range from a minimum of 92% to a minimum of 94% and upper targets range from 96% to 98%. All services administer fluids, however, dosages vary significantly between 20 – 60 ml/kg for weight based dosing and 250 ml to 1 L for bolus dosing.

All JASs have vasopressor / inotropic agents available to intensive care paramedics. Adrenaline is used in nine cases, with one of these restricted to bradycardia and another restricted to hypotension, and initial dosing varying from 2 – 8.3 mcg/minute. Noradrenaline is used by specialist paramedics in

three services, with one of these requiring doctor approval. Metaraminol is used by ICPs in three services and restricted to specialist paramedics in two services, with one of these requiring doctor approval.

One JAS allow pre-hospital blood samples to be taken by paramedics, while a second is restricted to specialist paramedics with additional training. One service allows paramedics to take lactate measurements, with a second service having capability but use not indicated for sepsis and restricted to specialist paramedics. Endotracheal intubation unassisted is available to Paramedics in one service and restricted to ICPs in the remaining nine services. Intubation facilitated by sedation or ketamine-only breathing intubation is authorised by one service. Rapid or delayed sequence induction is available to ICPs in six services, restricted to specialist ICPs in two services, and not available in two services.

Conclusion

This paper reviews and summarises the existing paramedic management for adult sepsis provided by Australasian JASs. The different JASs in Australasia have each created unique CPGs for the treatment of sepsis in adult patients. There are high levels of similarity in the use of antibiotics for meningococcal septicaemia, adrenaline as a vasopressor, and oxygen. There are significant variations in the choice of antibiotic, when to administer antibiotics, if consultation is required for administration of antibiotics, use of paracetamol as an antipyretic, use of corticosteroids, use of additional vasopressors, dosage of vasopressors, ability to perform phlebotomy, ability to take lactate measurements, and endotracheal intubation (unassisted, facilitated or by ketamine only, and rapid or delayed sequence induction).

It would be appropriate for further research to be undertaken comparing each of these interventions against best available evidence, and additionally for the guideline development groups of each service to liaise directly to compare the evidence informing their decisions.

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Competing interests

All three authors are members of the Australasian College of Paramedicine Clinical Practice Guideline Special Interest Group, who have endorsed the creation of this series. This includes the Chair (Sonja Maria) and Vice-Chair (Marc Colbeck). Each author has completed the ICMJE conflict of interest statement.

Reference

1. Wilkinson-Stokes M, Maria S, Colbeck M. A comparison of Australasian jurisdictional ambulance services' clinical practice guidelines series: an introduction. *Australasian Journal of Paramedicine* 2021;18. doi.org/10.33151/ajp.18.914

Table 1. Summary of the scope of practice for Australasian paramedics working in jurisdictional ambulance services

JAS	Year relevant guideline within the 2021 CPGs was last updated	Pharmacology									Intervention				
		Antibiotic			Antipyretic	Corticosteroid	Isotonic, acidic volume filler		Vasopressor / inotrope						
		Ceftriaxone (IM/IV)	Benzylpenicillin (IM/IV)	Amoxicillin, clavulanic acid, +/- gentamicin (IV)	Paracetamol (per oral)	Dexamethasone	Sodium chloride 0.9% (IV)	Sodium lactate (IV)	Adrenaline (infusion)	Noradrenaline (infusion)	Metaraminol (IV)	Phlebotomy	Lactate measurement	Endotracheal (ETT) unassisted	ETT – KOB & IFS
Australian Capital Territory (ACTAS)	2020	✓ (3)					✓					✓	ICP		ICP
New South Wales (NSWA)	2018		✓ (3)		✓		✓	(12)			Restricted (11)		ICP		
New Zealand (SJNZ)	2019	✓ (3)		✓ (7)			✓			ICP			ICP		ICP
New Zealand (WFA)	2019	✓ (3)		✓ (7)			✓			ICP			ICP		ICP
Northern Territory (SJNT)	2013 (1)	✓ (3)			✓		✓	ICP (13)					ICP	ICP	ICP
Queensland (QAS)	2021	✓ (3) or (4,5)			✓		✓		Restricted (4,8)	Restricted (10)		(10,14)	ICP		Restricted (10)
South Australia (SAAS)	2021		✓ (3)				✓ (15)	(15)	Restricted (9)	Restricted (4,9)			ICP		Restricted (9)
Tasmania (AT)	2015	✓ (3) or (4,6)					✓ (4,6)	✓					ICP		
Victoria (AV)	2010 (1,2)	✓ (3) or (4,5)					✓		Restricted (8)				ICP		ICP
Western Australia (SJWA)	2017						✓			ICP	✓		✓		ICP

DSI = Delayed sequence intubation IFS = Intubation facilitated by sedation KOB = Ketamine-only breathing intubation RSI = Rapid sequence induction

(1) Guidelines currently undergoing review (2) AV have advised their guideline review has been intentionally delayed to allow completion of the PASS Clinical Trial (ACTRN12618000199213) (3) Meningococcal septicaemia only (4) Medical consult required (5) Transport time over 60 minutes (6) 'Prolonged' transport time (7) Transport time over 30 minutes (8) ICP – Flight Paramedic only (9) ICP – Retrievalist Flight Paramedic only (10) ICP - High Acuity Response Unit only (11) Additional training required (12) Not indicated for sepsis specifically; however, indicated for bradycardia (13) Not a true infusion; repeated intravenous boluses (14) Use of lactate measurement is available but not indicated on sepsis CPG (15) Only if systolic blood pressure <100 mmHg

Table 2. Summary of the definitions and diagnostic criteria for sepsis used by each jurisdictional ambulance service

JAS	Year relevant guideline within the 2021 CPGs was last updated	Diagnosis	Temperature (°C)	Respiratory rate (minutely)	Systolic BP (mmHg)	Heart rate (minutely)	Cognition	SpO ₂	Lactate (mmol/L)	Age (years)	Urine	Immune system	Blood glucose level (mmol/L)	Skin	Other criteria
Australian Capital Territory (ACTAS)	2020	Sepsis			<100										Nuchal rigidity, headache, recent history of fever / rigors, abdominal pain / distension, diarrhoea, cough, dyspnoea, pneumonia, recent surgery or invasive procedure, indwelling medical device, cellulitis, septic arthritis, wound infection
		Severe sepsis		>22	<90		Altered from baseline		>2		Dysuria	Immunocompromised		Mottled or cold peripheries, capillary refill >3 seconds, purpuric rash	
New South Wales (NSWA)	2018	Either	Two of:	<35.5 or >38.5	5-10 or 25-30	90-100 or 180-200	40-50 or 120-140	Voice or pain					<4		
			Or one of:		<5 or >30	<90 or >200	<40 or >140	Unresponsive					<4 with decreased consciousness		
		Plus any one of:									>65		Immunocompromised		Pre-presentation within 48 hours of medical care, indwelling device, recent surgery or wound, fall
		To determine a new infection look for:	Fever					Altered from baseline				Dysuria			Rigor, cough, sputum, dyspnoea, abdominal pain or distension, peritonism, line associated infection / redness / swelling / pain

New Zealand (SJNZ)	2019	Medium risk	<36	21-24	91-100	91-130 or new dysrhythmia	Hx of altered or deterioration from family / carer				Anuria in 12-18 hours or <0.5 ml/kg/hr if catheterised	Impaired (including steroids)		Signs of infection	Trauma, surgery, or invasive procedure in 12 weeks	
		High risk		>25	<90 or drop of >40	>130	Altered from baseline	>92 requires oxygen (>88 for COPD)				Anuria in 18 hours or <0.5 ml/kg/hr if catheterised	Neutropenia		Petechiae/ purpura, mottled, ashen, cyanotic	
New Zealand (WFA)	2019	Medium risk	<36	21-24	91-100	91-130 or new dysrhythmia	History of altered or deterioration from family / carer				Anuria in 12-18 hours or <0.5 ml/kg/hr if catheterised	Impaired (including steroids)		Signs of infection	Trauma, surgery or invasive procedure in 12 weeks	
		High risk		>25	<90 or drop of >40	>130	Altered from baseline	<92 requires oxygen (<88 for COPD)				Anuria in 18 hours or <0.5 ml/kg/hr if catheterised	Neutropenia		Petechiae/ purpura, mottled, ashen, cyanotic	
Northern Territory (SJNT)	2013	Sepsis		>20		>90										
		Septic shock	<36 or >38			>100	Altered from baseline					Reduced urine output			Mottled	Source of infection, pulmonary oedema, dyspnoea
Queensland (QAS)	2021	Moderate risk	<35.5 or >38.4	21-24	90-99	90-130 or new dysrhythmia	Deterioration in functional abilities				Anuria in 12-18 hours or reduced urine output					
		High risk		>25	<90 or drop of >40	>130	Altered from baseline	<92 requires oxygen				Anuria in 18 hours or reduced urine output	Recent chemotherapy		Non-blanching rash, mottled, ashen, cyanotic	
		Red flags											>65	Immunocompromised, asplenia, neutropenia, unimmunised		Re-presentation within 48 hours, recent trauma / surgery / invasive procedure / wound within 6 weeks, indwelling device, Indigenous Australian background, family or carer concern

South Australia (SAAS)	2021	Infection													Pneumonia, UTI, abdominal pain / distension, diarrhoea, meningitis, indwelling medical device, cellulitis, infected wound
		Sepsis		>22	<100		Altered from baseline								
Tasmania (AT)	2015		<36 or >38	>20	<90	>90									Infection or major insult
Victoria (AV)	2010		<36 or >38	>20	<90	>90									Infection or major insult
Western Australia (SJWA)	2017	Septic shock		>20	<100		Altered								Evidence of infection, haemodynamic instability, dysrhythmia, MODS, DIC

Table 3. Number of JASs providing each treatment (10 services total)

Treatment	Paramedic	Intensive Care Paramedic	Restricted	Not used
Antibiotic*	5			5
Antipyretic	3			7
Corticosteroid	1			9
Adrenaline		9		1
Noradrenaline			3	7
Metaraminol		3	2	5
Phlebotomy	1		1	8
Lactate	1			9
ETT unassisted	1	9		
ETT facilitated		1		9
ETT RSI		6	2	2

*Excluding meningococcal meningitis, which all services except one allow paramedics to administer antibiotics for

Table 4. Antibiotics for sepsis comparison

Australian Capital Territory (ACTAS)	Ceftriaxone (meningococcal septicaemia only), 50 mg/kg, maximum 2 g
Northern Territory (SJNT)	Ceftriaxone (meningococcal septicaemia only), 4 g
Queensland (QAS) Tasmania (AT)	Ceftriaxone, 2 g
Victoria (AV)	Ceftriaxone, 1 g
New South Wales (NSWA)	Benzylpenicillin (meningococcal septicaemia only), 1.2 g
South Australia (SAAS)	Benzylpenicillin (meningococcal septicaemia only), 2.4 g
New Zealand (WFA) New Zealand (SJNZ)	Amoxicillin, clavulanic acid (sepsis – soft tissue, joint, thoracic), 1.2 g Amoxicillin, clavulanic acid, gentamicin (sepsis – urinary, peritoneal), 1.2 g amoxicillin, 240 – 400 mg gentamicin depending on weight Ceftriaxone (meningococcal septicaemia), 2 g
Western Australia (SJWA)	Not carried

Table 5. Paracetamol for sepsis comparison

Queensland (QAS) New South Wales (NSWA) Northern Territory (SJNT)	500 mg - 1 g
Australian Capital Territory (ACTAS) New Zealand (WFA) New Zealand (SJNZ) South Australia (SAAS) Tasmania (AT) Victoria (AV) Western Australia (SJWA)	Not indicated

Table 6. Fluids for sepsis comparison

Australian Capital Territory (ACTAS)	20 ml/kg, target systolic blood pressure >90 mmHg, repeat PRN, no maximum
Queensland (QAS)	PRN, reassessed every 250-500 mL
New South Wales (NSWA)	20 mL/kg, repeat PRN, no maximum
New Zealand (WFA)	1 L, maximum 2 L
New Zealand (SJNZ)	1 L, maximum 2 L
Northern Territory (SJNT)	250-500 mL, repeat PRN, maximum 40 mL/kg
South Australia (SAAS)	1250 ml boluses, maximum 20 ml/kg (ICP maximum 30 ml/kg)
Tasmania (AT)	20 mL/kg (ICP maximum 40 mL/kg)
Victoria (AV)	20 mL/kg over 30 minutes (ICP maximum 60 mL/kg)
Western Australia (SJWA)	250 mL boluses, maximum 2 L (small adult, elderly maximum 1 L)

Table 7. Adrenaline for sepsis comparison

Australian Capital Territory (ACTAS)	2 mcg/min, titrated to response
Queensland (QAS)	20-50 mcg bolus, then 10-50 mcg/min
New South Wales (NSWA) South Australia (SAAS) Victoria (AV)	5 mcg/min, titrated to response, no maximum
New Zealand (WFA) New Zealand (SJNZ)	8.3 mcg/min, titrated to response
Northern Territory (SJNT)	20 mcg boluses, repeat every 1 minute, no maximum
Tasmania (AT)	5 mcg/min, titrated to response, maximum 50 mcg/min
Western Australia (SJWA)	Not indicated

Table 8. Noradrenaline for sepsis comparison

Queensland (QAS)	5 mcg/min, increasing by 1-2 mcg/min every 3-5 minutes
South Australia (SAAS)	5 mcg/min, maximum 25 mcg/min*
Victoria (AV)	5 mcg/min, maximum 25 mcg/min
Australian Capital Territory (ACTAS) New South Wales (NSWA) New Zealand (WFA) New Zealand (SJNZ) Northern Territory (SJNT) Tasmania (AT) Western Australia (SJWA)	Not carried

*Not a strict protocol

Table 9. Metaraminol for sepsis comparison

Queensland (QAS)	500 mcg, repeat every 1 minute
New Zealand (WFA) New Zealand (SJNZ) Tasmania (AT)	500 mcg – 1 mg bolus, then 2 mg/hr titrated to response
South Australia (SAAS)	500 mcg – 1 mg bolus, then titrated to response
Western Australia (SJWA)	500 mcg – 1 mg, repeat at 3 minutes
Australian Capital Territory (ACTAS) Northern Territory (SJNT) New South Wales (NSWA) Victoria (AV)	Not carried

*Not a strict protocol

Table 10. Oxygen for sepsis comparison

Australian Capital Territory (ACTAS)	Target SpO ₂ above 94%
New South Wales (NSWA) Northern Territory (SJNT) South Australia (SAAS) Tasmania (AT) Western Australia (SJWA)	Target SpO ₂ 94-98%
New Zealand (WFA) New Zealand (SJNZ)	Target SpO ₂ 94-97%
Queensland (QAS)	Target SpO ₂ 94-98%
Victoria (AV)	100% oxygen at 10-15 L/m until haemodynamically stable, then target SpO ₂ 92-96%